Before the
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, DC 20554

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In the Matter of	)	
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Office of Engineering and Technology Invites Comments on Technological Advisory Council (TAC) White Paper and Recommendations for Improving Receiver Performance	)	ET Docket No. 13-101
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COMMENTS OF ROCKWELL COLLINS, INC.

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Rockwell Collins, Inc. ("Rockwell Collins") submits the following comments in response to the Federal Communications Commission's ("FCC" or "Commission") request for comments in the above-referenced docket.[1] Rockwell Collins is concerned that the TAC White Paper does not adequately consider the enormous cost, regulatory inefficiency, and potential risk to aviation safety that would result from imposing new harm claim thresholds on GPS receivers.

These comments offer three critical concerns that should motivate TAC to revise its recommendations. First, the White Paper's interference limits characterization is incompatible with the design of existing GPS receivers, which are critical to aviation safety. Second, the White Paper's proposed new threshold requirements could impose unacceptable retrofitting costs for existing GPS receivers, which last for decades and are installed across the aviation industry, and could jeopardize air safety. Finally, the current standards process run by expert domestic

[1] *See Office of Engineering and Technology Invites Comments on Technological Advisory Council (TAC) White Paper and Recommendations for Improving Receiver Performance*, Public Notice, 28 FCC Rcd 5274 (rel. Apr. 22, 2013).

and international bodies has operated effectively and is well positioned to maintain aviation safety.

I. INTRODUCTION

Rockwell Collins is an industry leader in providing communications and aviation electronics solutions, including radio communications and GPS, to both commercial aviation customers and the U.S. Department of Defense ("DoD"). Rockwell Collins was the first company to successfully track the GPS signal in space, and has participated in GPS development activities in conjunction with the DoD and Federal Aviation Administration ("FAA") for over three decades. Rockwell Collins is also a leading supplier of GPS avionics solutions for commercial air transport with our GPS4000, Global Landing Unit, and Global Navigation Landing Unit product lines. In addition, Rockwell Collins supplies military selective availability anti-spoofing module GPS to a broad range of airborne, maritime, ground-mobile, and weapon system providers, with over one million military GPS receivers delivered and deployed throughout the world.

These products, in conjunction with those of our competitors, serve as the backbone of global aviation navigation systems. These products have revolutionized precision approach and landing through widely deployed systems, such as the FAA's Wide Area Augmentation System and the Ground Based Augmentation System. As a result, general aviation, commercial and military flights today enjoy greater safety, navigation accuracy and integrity than ever before.

Rockwell Collins recognizes the increasing demand for spectrum and the need to maximize spectral efficiency and the benefits of wireless operations. In fact, many of Rockwell Collins' products rely on wireless broadband spectrum. However, Rockwell Collins products also rely on the current framework by which aviation receiver performance standards are set for

GPS and radio communications products. Those products are used for a variety of civilian and military applications, in most instances for safety of life purposes.

II. HARM CLAIM THRESHOLDS PROPOSED BY THE WHITE PAPER ARE INCONSISTENT WITH THE DESIGN OF EXISTING GPS RECEIVERS, WHICH ARE ESSENTIAL TO SAFETY

The White Paper's interference limit characterization is incompatible with the design of existing GPS receivers, which are critical to safety. The FCC has long regulated how, when, and where emitters are allowed to operate without regulating receiver performance.[2] Based on current emitter regulations, aviation receivers are designed to perform adequately in the presence of the worst-case interference for a given minimum desired signal scenario, given receiver performance standard specifications set by the relevant regulatory bodies (as described further below).[3]

Breaking with this time-tested approach, the TAC White Paper proposal indirectly impacts standards for receivers by establishing interference thresholds—characterized in terms of Power Flux Density ("PFD") or field strength over a percentage of locations and times—below which the FCC will not act on complaints.[4] It assumes that emitters, including new emitters using new waveforms, will be licensed and sited in such a manner that interference above these thresholds will occur only in a few areas, and then only for short periods of time.

However, GPS receivers are not amenable to this type of harm threshold characterization. GPS receivers are designed to provide aviation safety of life and critical federal/government

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[2] FCC Technological Advisory Council Receivers and Spectrum Working Group, *Interference Limits Policy: The Use of Harm Claim Thresholds to Improve the Interference Tolerance of Wireless Systems*, 5 (rel. Feb. 6, 2013) ("*White Paper*") *available at* http://transition.fcc.gov/bureaus/oet/tac/tacdocs/WhitePaperTACInterferenceLimitsv1.0.pdf.
[3] *See id*. at 48-50, 18-19 (outlining receiver performance regulations and design decisions for receiver performance).
[4] *Id*. at 9-14.

services on a continuous, uninterrupted, location agnostic basis with a very high level of availability (of the order of 1e-7/hr). GPS receivers therefore must have clear, unambiguous interference limits (a.k.a. "masks") and corresponding interference contribution allocations to adjacent band services. Any interference above this mask would be excessive.[5] For example, an analysis of expected receive power from a proposed ground based transmitter operating near the GPS band showed that the received power from this transmitter was far higher than the interference threshold allocation for GPS tracking.[6] This interference implies that GPS service may not be available for helicopter air ambulance operations in that area if this transmitter were operational—and demonstrates that the TAC proposal poses a risk to aviation safety.

III. SHIFTING TO THE PROPOSED INTERFERENCE LIMITS POLICY APPROACH DISREGARDS THE LARGE INSTALLED BASE OF AVIATION RECEIVERS AND THEIR LONG LIFESPAN

The TAC White Paper proposals ignore that creating new receiver harm threshold criteria would strand enormous investment in current GPS systems, potentially require retrofits that could not be completed in time, and could jeopardize air safety. According to the White Paper, as part of the proposal to move to a new system, "[t]he cellular operator would then have to bear the cost of retrofitting aviation systems with improved filters if it wanted to deploy a system that did not meet these limits."[7]

This approach would impose unreasonable costs. Certified aviation GPS equipment that is used for safety of life and U.S. military applications has a typical lifespan of 20-30 years.

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[5] Relevant statistical distributions of interference signal levels at the GPS receiver must not impose any additional burden on the receiver's ability to meet the required availability and continuity requirements for safety of life applications.

[6] Federal Aviation Administration, *Status Report: Assessment of Compatibility of Planned LightSquared Ancillary Terrestrial Component Transmission in the 1526-1536 MHz Band with Certified Aviation GPS Receivers*, 57-58 (Jan. 25, 2012).

[7] *White Paper*, 15.

Rockwell Collins has many radios and GPS units in our product lines, all of which met emissivity and interference standards when designed. Even if a retrofit filter could be designed, it would cost untold millions of dollars to design and reconfigure GPS unit installations to accommodate such filters across the civil and military receiver trade space. There would be further complications with the limited amount of cockpit space for revised units in the aircraft.[8] Thus, any changes that would force redesign and retrofit of a large amount of equipment would be unacceptable to our customers in the military and civil aviation aircraft markets.

The retrofit proposal also would require inordinate administrative resources and take so long that it would not be feasible. A filter retrofit into a fleet of aircraft would take approximately 8-10 years, if not longer. This would not only cost manufacturers and operators huge sums of money, but would require an unprecedented commitment of FAA resources to address certification, even assuming the filtering technology were proven and viable. In any event, a retrofit timetable this long is clearly not viable since aviation systems being used today cannot wait 8-10 years for a fix that would ensure their safe operation.

In the meantime, any demand for massive redesign and retrofit of avionics GPS receivers would jeopardize aviation safety. The White Paper proposes harm claim thresholds characterized by an adjacent band signal's field strength or, alternately, by the PFD that a service like GPS is required to tolerate. This approach would be incompatible with existing equipment, potentially causing GPS malfunctions and accidents and loss of life, and should be rejected. Instead, the FCC should institute strong protections against such impacts on the aviation spectrum, no matter the final form of the interference limits policy.

[8] Other issues include generating updated Minimum Operations Performance Specification requirements and Technical Standard Orders, and certification and implementation costs associated with each unit and each aircraft type.

IV. THE CURRENT STANDARDS-SETTING PROCESS PROMOTES AVIATION SAFETY AND EFFICIENCY

This existing standards-setting process has historically worked well, and changing the process could impact aviation safety. Currently, GPS interference masks are formulated by multi-stakeholder groups at forums such as the RTCA, Inc. ("RTCA") in the United States.[9] RTCA brings in an array of government and industry stakeholders to develop its standards, which it then uses to establish Minimum Operations Performance Specification ("MOPS") documents, which, in turn, are used by the FAA to establish Technical Standard Orders ("TSOs").[10]

These standards are then harmonized on an international level. The International Civil Aviation Organization ("ICAO"), a United Nations agency, "sets standards and regulations necessary for aviation safety, security, efficiency and regularity."[11] ICAO makes recommendations to States (i.e., countries) on the applicable standards via Standards and Recommended Practices,[12] usually drawing on FAA and European Aviation Safety Agency standards.

This international harmonization is valuable for a number of reasons. Because aircraft fly worldwide, it ensures that that GPS equipment is compatible wherever aircraft fly around the globe. It also allows Rockwell Collins and others to design and manufacture GPS products in

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[9] *See, e.g.*, RTCA, *Assessment of Radio Frequency Interference Relevant to the GNSS L1 Frequency Band*, RTCA Document No. RTCA/DO-235B (Mar. 13, 2008); RTCA, *Minimum Operational Performance Standards for Global Position System/Wide Area Augmentation System Airborne Equipment*, RTCA Document No. RTCA/DO-229D (Dec. 13, 2006).
[10] RTCA, Mission and History, http://www.rtca.org/content.asp?contentid=117 (last visited Jul. 22, 2013).
[11] ICAO, About ICAO, http://www.icao.int/about-icao/Pages/default.aspx (last visited Jul. 22, 2013).
[12] *See* ICAO, SARPs - Standards and Recommended Practices, http://www.icao.int/safety/SafetyManagement/Pages/SARPs.aspx (last visited Jul. 22, 2013).

compliance with a single set of standards for sales worldwide. In addition, this harmonization promotes safety because non-U.S. aircraft fly into U.S. airspace, and the U.S. role in the current international standards setting allows it to have meaningful influence over the international standards that ensure aircraft safety.

The current system is also beneficial because it allows the DoD, a major user of GPS systems, to have valuable input towards receiver design. DoD regulates how equipment is certified, procured through specifications and standards it has promulgated. DoD's standards are reflected in the issuance of DoD's Military Standard Orders and various product procurement specifications for military GPS equipment used throughout the U.S. Armed Forces.[13]

V. CONCLUSION

For the foregoing reasons, Rockwell Collins recommends that the current process continue to be used for avionics radios and GPS receivers in spectrum used for aviation purposes. Rockwell Collins is committed to working with both the FCC and industry working groups to resolve spectrum and receiver performance policy issues in a way that protects safety and existing investment. Because of the large scope and scale of aviation GPS, policy directives that require changes to spectrum allocations which impact aviation safety must be coordinated with the FAA and other relevant stakeholders, including GPS receiver manufacturers and platform integrators. We also recommend that the FCC utilize the resources and subject matter expertise of the FAA, the National Telecommunications and Information Administration, the GPS Directorate, ICAO, the International Telecommunication Union and other aviation industry

[13] *See, e.g.*, Department of Defense, GPS Wing, *Airborne Navigation Sensors Using the Global Positioning System (GPS) / Precise Positioning Service (PPS) for Area Navigation (RNAV) in Required Navigation Performance (RNP) Airspace; RNP-20 RNAV through RNP-0.3 RNAV*, Military Standard Order No. MSO-C145a (Feb. 11, 2010), *available at* http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA549057.

stakeholders when evaluating the safety impacts of changes in different aviation frequency bands.

Respectfully submitted,

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